

PRISM® 11Mbps Wireless Local Area Network Access Point



The Intersil ISL36356A WLAN Access Point (AP) is a complete wireless high speed network AP utilizing the Intersil PRISM® 2 AP

Direct Sequence Spread Spectrum (DSSS) wireless transceiver chip set. It provides a complete PRISM reference design evaluation platform of hardware and software to system providers or integrators requiring wireless data communications capability and is ideal as a stand-alone AP.

To get your evaluation started quickly, evaluation kits include a WLAN AP, PC card (ISL37300P) designed to Intersil's PRISM reference design, configuration application and documentation. The kit supports the IEEE 802.11b network specification for DSSS signaling, providing data rates of 11, 5.5, 2, and 1Mbps. Typical operating ranges are shown in Table 1.

TABLE 1. TYPICAL OPERATING RANGE*

| DATA RATE (Mbps) | INDOOR RANGE | OUTDOOR RANGE |
|------------------|----------------------|------------------------|
| 11 | 120 feet (37 meters) | 500 feet (152 meters) |
| 5.5 | 200 feet (61 meters) | 800 feet (243 meters) |
| 2 | 240 feet (73 meters) | 1300 feet (396 meters) |
| 1 | 300 feet (91 meters) | 1750 feet (533 meters) |

*The range will vary in different operating environments due to effects such as building construction.

Ordering Information

| PART NUMBER | DESCRIPTION | INCLUDED |
|---------------------|---------------------|-----------|
| ISL36356A-APBK-EVAL | WLAN Evaluation Kit | 1 AP |
| | | 1 PC card |

Packaging



Sample plastic enclosure.

Features

- Supports the IEEE 802.11b direct sequence specification
- FCC certified under Part 15 to operate in 2.4GHz ISM band
- ETSI EN 300 328 Parts 1- and 2-, and ETSI EN 301 489 Parts 1- and 17-certified
- Supports all features required for Wi-Fi™ compliant access points
- Support for 11, 5.5, 2 and 1 Mbps data rates
- ASBF (automatic scale back functionality) 11, 5.5, 2, and 1 Mbps selected dynamically
- Supports dual antenna diversity
- Supports short preamble
- Advanced RAKE receiver design with decision feedback equalizer
- Provides wired ethernet (802.3) supporting both 10/100BaseT speeds
- Wired equivalent privacy (WEP), 64 & 128 bit
- Access control list
- Embedded web server
- Wizard for automated IP configuration
- Complete reference design: ISL36356A now available to ensure minimum time-to-market

References

For Intersil documents available on the internet, see the web site at <http://www.intersil.com/>

- [1] *TB337 Tech Brief*, Intersil Corporation, "A Brief Tutorial on Spread Spectrum and Packet Radio."
- [2] *AN9850 Application Note*, Intersil Corporation, "Complementary Code Keying Made Simple."
- [3] *AN9829 Application Note*, Intersil Corporation, "Brief Tutorial on IEEE 802.11 Wireless LANs."
- [4] *AN9820 Application Note*, Intersil Corporation, "A Condensed Review of Spread Spectrum Techniques for ISM Band Systems."
- [5] *FN8028 Datasheet*, Intersil Corporation, "PRISM II AP Chip Set Overview."

Further information can be found in the following:

IEEE 802.11 Standards Project (available from the IEEE, New York, USA). Find it at <http://www.ieee.org/>

Absolute Maximum Ratings

Supply Voltage -0.3V to 7.5V (Max)
 Storage Temperature (Note 1) -20°C to 85°C

Operating Conditions

Temperature Range 0°C ≤ T_A ≤ 50°C
 Supply Voltage Range 4.5V to 5.5V

Caution: These are the absolute maximum ratings for the product. Exceeding these limits could cause permanent damage to the AP.

NOTE:

1. All temperature references refer to ambient conditions.

Electrical Specifications

Test Conditions: Supply Voltage (V_{CC}) = 5V, Ambient Temperature (T_A) = 25°C,
 Unless Otherwise Specified

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNITS |
|--|--------------------|-------------------------|------|---------------------|------|-------|
| CURRENT CONSUMPTION | | | | | | |
| Initialization Current | I _{CC} | | - | 517 | - | mA |
| Average Current (2% TX; 8% RX; 90% Standby) (With Power Saving Mode) | I _{CC} | | - | 485 | - | mA |
| Continuous Transmit Mode | I _{CC} | | - | 670 | - | mA |
| Continuous Receive Mode | I _{CC} | Receiving Valid Packets | - | 516 | - | mA |
| RF SYSTEM SPECIFICATIONS | | | | | | |
| Transmitter Power Output | P _{out} | | 14.8 | 16.2 | 17.0 | dBm |
| Receive Sensitivity | RX_S | 1Mbps, BER 8 E-5 | - | -93* | - | dBm |
| | | 2Mbps, BER 8 E-5 | - | -89* | - | dBm |
| | | 5.5Mbps, BER 8 E-5 | - | -87* | - | dBm |
| | | 11Mbps, BER 8 E-5 | - | -83* | - | dBm |
| Multipath Delay Spread | T _{DELAY} | 2Mbps, BER 8 E-5 | - | >500 | - | ns |
| | | 5.5Mbps, BER 8 E-5 | - | 220 | - | ns |
| | | 11Mbps, BER 8 E-5 | - | 120 | - | ns |
| Maximum Receive Level | RX_MAX | BER 8 E-5 | -3 | >2 | - | dBm |
| Third Order Intercept Point (Input) | IIP3_90 | -90 dBm input | - | -3 | - | dBm |
| | IIP3_25 | -25 dBm input | - | +20 | - | dBm |
| Carrier Suppression | TX_sup | Test Mode | - | 43 | - | dB |
| Image Rejection | IR | BER 8E-5 | - | 65 | - | dB |
| IF Rejection | IFR | BER 8E-5 | 60 | 66 | - | dB |
| Adjacent Channel Rejection | ACR | BER 8E-5 | - | 35 | - | dB |
| Data Rate (Physical Layer) | Rate | | - | 1, 2, 5.5 and 11 | - | Mbps |

* Measurements from antenna on port 1. Antenna port 2 provides 1–2 dB better performance.

Functional Overview

The WLAN AP is designed to operate in the 2.4GHz ISM frequency band, channels 1–11, as specified by the FCC in the U.S. The AP will also operate on channels 12–14, where permitted by local regulatory authorities. Radio equipment must be certified in a given country prior to use. Refer to Table 3 for a list of countries and agencies that have approved the ISL36356A-ABPK-EVAL for operation.

The Intersil PRISM 2 AP chip set allows for high-level integration; providing reduced size, increased throughput, improved radio performance and faster time to market. The WLAN AP implements DSSS technology that provides superior noise and signal jamming immunity; including less severe impact from unintentional radiators such as microwave ovens. By using an AP, the wireless LAN can be set up to allow an even greater number of users to interconnect, and to increase the coverage area. The wireless LAN can be easily connected into an existing wired LAN, allowing for easy expansion of the service.

The ISL3856 Media Access Controller (MAC) Protocol Handler

The ISL3856 MAC processor and its firmware are responsible for running the IEEE 802.11 protocol in the WLAN AP. This section describes the features of IEEE 802.11 that are implemented.

The functions supported by the AP Firmware are:

- CSMA/CA (carrier sense multiple access with collision avoidance) with random backoff
- WEP security
- Short/long preamble with multirate
- RTS/CTS handshake (ready to send/clear to send)
- MAC-level acknowledgments
- Re-transmission of unacknowledged frames
- Duplicate detection and rejection
- Broadcast and multicast frames
- Fragmentation and re-assembly
- Supports client's power save mode
- Timestamp synchronization
- DCF (distributed coordination function)

IEEE 802.11 International Agreement and Frequency Assignments

The IEEE 802 LAN committee has forged an international agreement providing for wireless data communication standards for the frequency range of 2.4–2.4835GHz, as allocated by the FCC in the USA, and in the 2.471–2.497GHz frequency range, as specified by the regulatory authority in Japan. These standards are designed to focus the industry to develop highly integrated, low-cost, interoperable WLAN equipment, of which the ISL36356A-ABPK-EVAL is a prime example.

In the U.S., there are 11 channels specified by the FCC in the 2.412GHz to 2.462GHz range. In Japan, channel 14 at 2.484GHz is authorized under ARIB STD-33 and channels 1-13 are authorized under ARIB STD-T66. The ETSI (European) regulatory body conforms to the USA (FCC) channel assignments with the exception that channels 12 and 13 are also allowed. Some countries in Europe, notably France and Spain, have unique channel restrictions.

Although information contained in Table 2 is deemed to be accurate, local regulatory authorities should be consulted before using such equipment.

The available channels of operation in the 2.4GHz to 2.4835GHz and 2.471GHz to 2.497GHz ranges are as follows:

TABLE 2. IEEE 802.11 CHANNELS

| CHANNEL NUMBER | CHANNEL FREQUENCY | GEOGRAPHIC USAGE |
|----------------|-------------------|------------------------|
| 1 | 2412MHz | US, CA, EU, JP |
| 2 | 2417MHz | US, CA, EU, JP |
| 3 | 2422MHz | US, CA, EU, |
| 4 | 2427MHz | US, CA, EU, JP |
| 5 | 2432MHz | US, CA, EU, JP |
| 6 | 2437MHz | US, CA, EU, JP |
| 7 | 2442MHz | US, CA, EU, JP |
| 8 | 2447MHz | US, CA, EU, JP |
| 9 | 2452MHz | US, CA, EU, JP |
| 10 | 2457MHz | US, CA, EU, JP, FR, SP |
| 11 | 2462MHz | US, CA, EU, JP, FR, SP |
| 12 | 2467MHz | EU, FR, JP |
| 13 | 2472MHz | EU, FR, JP |
| 14 | 2484MHz | JP |

KEY:

US = United States, CA = Canada, EU = European countries (except France and Spain), FR = France, SP = Spain, JP = Japan

The ISL36356A is shipped with U.S.-compliant firmware. In order to ensure regulatory-compliant channel usage in a particular country, special geographic-specific firmware is available for customer production assemblies which restricts channel usage. An example is ETSI-compliant firmware. Since the end user does not have the ability to alter this firmware, regulatory compliance is ensured.

Agency and Regulatory Body Approvals

The WLAN AP will comply to the standards shown in Table 3:

TABLE 3. COMPLIANCE STANDARDS

| COUNTRY | APPROVAL | NOTES |
|---------|---|-------------------------|
| USA | FCC Part 15, Sec. 15.247, Sec. 15.107 and 15.109 | Grant obtained |
| Canada | ICAN RSS-210 | Designed for compliance |
| Europe | EN 60950 EN 301 489-1 V1.2.1 (2000-08) EN 301 489-17 V1.1.1 (2000-09) EN 300 328 Part 1 V1.2.2 (2000-07) EN 300 328 Part 2 V1.1.1 (2000-07) | Certified |
| Japan | ARIB STD-T66 ARIB STD-33 | Designed for compliance |

FCC Information to User

This product does not contain any user-serviceable components and must be used with approved antennas only. Any product changes or modifications will invalidate all applicable regulatory certifications and approvals.

FCC Electronic Emission Notices

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesirable operation.

FCC Radio Frequency Interference statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

Operation of this equipment in a residential area may cause harmful interference in which case the user will be required to correct the interference at his or her own expense.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Guidelines for Human Exposure

The EIRP was measured for the lower, middle and highest frequencies used by the transmitter. The results in Table 4 are based on a safe distance between antenna and operator of eight inches. The equipment therefore fulfills the requirements on power density for general population/uncontrolled exposure of 1.0mW/cm² and so complies with the requirements of FCC Part 15.247 (b) (4) and FCC OET Bulletin 65 including supplements A, B and C.

TABLE 4. POWER DENSITY CALCULATION

| | Ch.1 | Ch.6 | Ch.11 |
|--|-------|-------|-------|
| Measured EIRP (mW) | 63.8 | 66.2 | 69.3 |
| Calculated Power Density (mW/cm ²) | 0.051 | 0.053 | 0.055 |

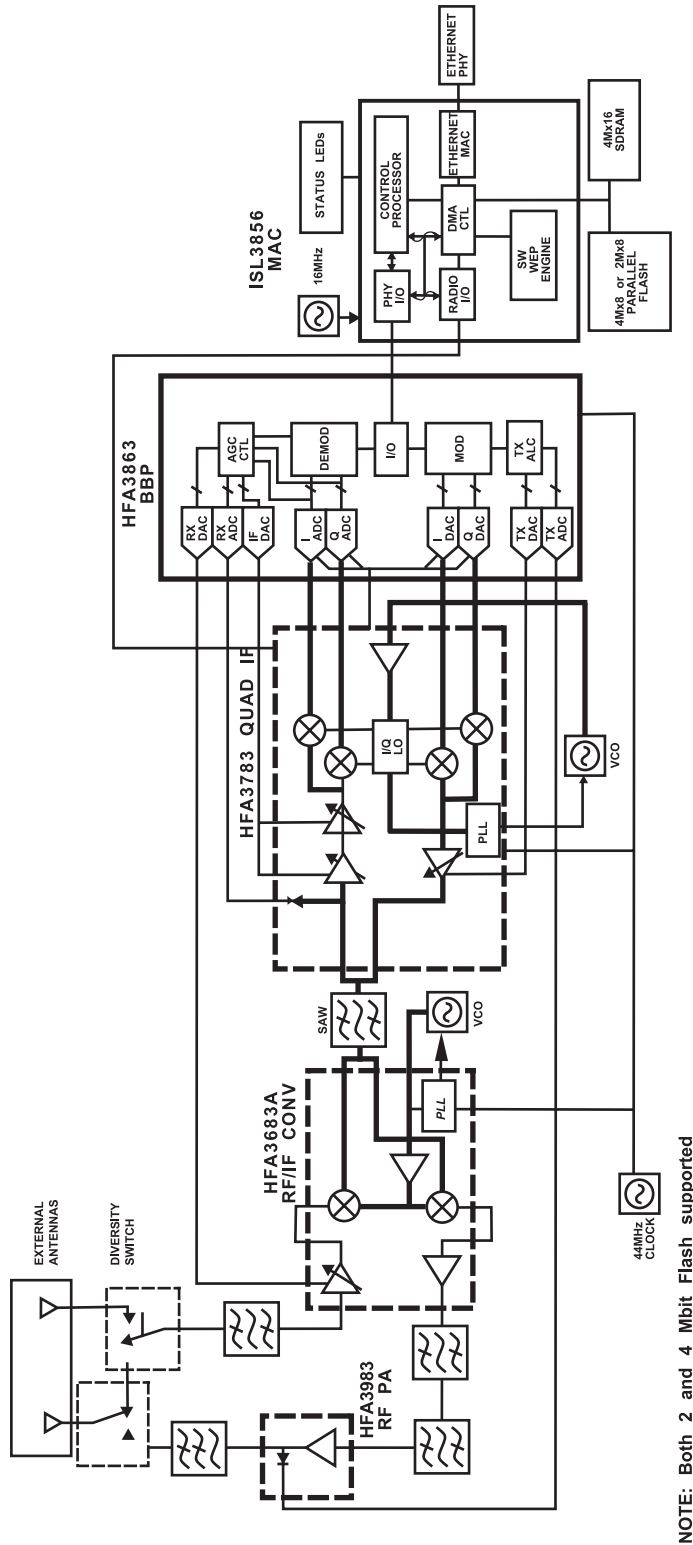
CAUTION: Any changes or modifications of equipment not expressly approved by Intersil could void the user's authority to operate the equipment.

WARNING: To comply with FCC RF exposure limits, a separation distance of at least 20 cm must be maintained between the antennas of this device and all persons.

Block Diagram

ISL3856 MAC

See Medium Access Controller description on page 3.



NOTE: Both 2 and 4 Mbit Flash supported

BBP ISL3863

The baseband processor (BBP) uses CCK modulation and a RAKE architecture to limit the effects of multipath. This reduces the error rates in typical office environments to improve overall data throughput.

HFA3783 IF

The IF is a linear design with AGC. This permits the use of equalizers in the BBP. An IF overload detector and selectable low gain LNA mode work with the BBP to extend dynamic range without sacrificing sensitivity. The IF frequency is 374 MHz. Filtering at the IF is done by a 374MHz SAW bandpass filter.

HFA3683 / HFA3983 RF

The RFICs are produced in advanced SiGe technology to realize improvements in integration, performance, and power consumption. Integral PLLs in both RF and IF parts eliminate the need for an external synthesizer. The HFA3683's internal LNA noise figure is improved so that an external LNA IC is no longer needed. The chipset is designed so that the parts can be interfaced with few external components.

The RF LO frequency is generated by an external VCO. The frequency range of the LO is 2083 MHz for channel 1 and 2098MHz for channel 13.

The PA incorporates an integral power detector that is monitored by the BBP. The BBP controls the IF gain to maintain constant output levels.

Antenna System

A dual spatial integrated antenna system is used to select the most optimal signal. The antennas are sleeved dipoles directly connected to the PCB.

Configuration application

The ISL36356A-APBK-EVAL kit can be configured by a Web interface. The AP contains an embedded Web interface platform that enables the hosting of a customized application. This application can be built in HTML, combined with a powerful proprietary extension to the server side includes (SSI) protocol. A default application is provided and loaded in this evaluation AP. It contains all basic configuration options. This default application can be customized or altered, or a new application can be built with the Web interface development kit (included with licensed reference design materials).

To ease the process of starting up the Web interface, Microsoft® Windows® 95, 98, 2000 and Microsoft® NT® wizards are included. They detect and automatically configure the IP settings in all common environments (DHCP, auto IP, static IP).

Features

The following features are included with licensed reference design materials:

- Customizable embedded Web interface
- Web interface development kit
- Customizable wizard for fully automated IP setting

Manual

The kit contains a comprehensive manual. The manual gives a basic explanation of 802.11b and how to configure a WLAN.

All Intersil products are manufactured, assembled and tested utilizing ISO9000 quality systems.
Intersil Corporation's quality certifications can be viewed at www.intersil.com/design/quality

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